

Claims 1-3, 14 and 16-27 are rejected under 35 U.S.C. §102(b) as being anticipated by Sano (EP 562,139). The Examiner specifically states that the claimed catalysts would read on the catalyst of Comparative Example 4 of the reference. Applicants respectfully traverse.

Applicants note that the present invention is directed to a process for the production of lower aliphatic esters. Accordingly, critical limitations in the claimed invention, not only the recited catalyst forming one part of the claim, must be considered in assessing anticipation and obviousness.

In that regard, Applicants note that claim 1 requires i) a saturated lower aliphatic monocarboxylic acid reactant; ii) a free acid silicotungstic heteropolyacid catalyst; iii) water in the range from 1 to 10 mole percent based on the total of the olefin, aliphatic monocarboxylic acid and water; and iv) the catalyst be supported (as amended--basis for this amendment is taken from existing claim 4 and page 3, lines 16-17, accordingly no new issues are raised by inclusion of this previously considered limitation).

With respect to Comparative Example 4 of Sano, water is not an ingredient included in the reaction. Accordingly, the presently claimed invention is not anticipated by Comparative Example 4. In addition--and of great significance--the space time yield reported by Sano for Comparative Example 4 is a miserable 3 grams per liter of catalyst per hour. Accordingly, the absence of water

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from the ingredients and the necessary conclusion that the acetic acid was not sufficiently high in water content to achieve Applicants demonstrated results, plus the fact that Sano does not use a siliceous support, proves that Sano failed to practice or recognize the benefits demonstrated by Applicants' system. In this regard, although the acetic acid was not designated as anhydrous by Sano, it is clear from the other examples of Sano, e.g. Example 1 and Example 7, that the acetic acid is likely to be anhydrous because additional water was added to those systems.

Furthermore, the industry standard specification for water in acetic acid is 0.15% by weight maximum. In fact, should the Examiner contend that the Sano acetic acid contained sufficient water, Applicants have analyzed representative samples of commercially available acetic acids and their respective water contents are depicted in the following table.

| Commercial Source | Water Content (wt. %) |
|-------------------|-----------------------|
| Quantum | 0.012 |
| Celanese | 0.024 |
| Saratov | 0.012 |
| Acetex | 0.069 |
| CPDC | 0.015 |
| BP Ulsan | 0.033 |
| Lonza | 0.003 |

In summary, this data evidences an industry standard for water in acetic acid at 0.15% by weight maximum, and the analysis of representative commercial

acetic acids shows water contents significantly below that standard maximum.

Assuming Sano used commercial acetic acid with a maximum 0.15% by weight water content in the Comparative Example 4, the volumetric acid:ethylene ratio of 6.8:93.2 provides a maximum concentration of water at 0.034% moles over total moles of all reactants. This is not comparable to Applicants' claimed 1-10 mole %. Moreover, given the ratio of acetic acid to ethylene in Comparative Example 4 of Sano, and taking the highest likely water concentration for the acetic acid, a systematic water content of at least 1 mole % of the total of the olefin, aliphatic monocarboxylic acid and water added to the reaction mixture as claimed by Applicants is not achieved. Importantly, given Applicants' results depicted in the specification, i.e. a STY often in excess of 200, the STY of Sano's Comparative Example 4 clearly confirms a significant distinction existed from the presently claimed invention which uses water, and in addition, a free silicotungstic acid on a siliceous support.

With respect to obviousness, Applicants refer to the procedure followed in Sano's Comparative Example 3, wherein water is added to a system employing a silicotungstic acid catalyst used in the conversion of acrylic acid. Again, Applicants note a very poor STY of 17 is achieved in the system. Importantly, the system is distinguishable from the presently claimed invention because an unsaturated acid is the starting material, as opposed to Applicants claimed saturated carboxylic acid

and no siliceous support is used for the catalyst by Sano.

In summary, Comparative Example 3 and Comparative Example 4 of Sano are similar to Applicants' claimed process. However, each example fails to include a key element of Applicants' invention and each demonstrates extremely poor performance. In this regard, Applicants' submit that there is not a remote suggestion from these examples in Sano to develop Applicants' system. In fact, given the extremely poor performance in Sano's Comparative Examples 3 and 4, there is no motivation provided to the skilled artisan to pursue this course of investigation. Therefore, the poor results in similar systems teaches away from Applicants' invention. In fact, Sano at page 2, lines 10-18 specifically teaches away from the use of free acids, discouraging an investigation which would have been necessary to determine that the presently claimed system is unexpectedly superior. In this regard, Applicants' results which demonstrate an STY averaging around 200, are unexpected and clearly rebut any prima facie case of obviousness. Accordingly, withdrawal of the rejection is respectfully requested.

Claims 1-6 and 8-11, 14 and 16-31 are rejected under 35 U.S.C. §103 as being unpatentable over Sano in view of Inoue and Deller. The Examiner specifically relies on Inoue as teaching the use of an ether such as an alkoxy substituted cyclopentane in the reaction zone. The Examiner specifically relies on Deller as showing specific carriers as known catalyst carriers.

First, as articulated above, Sano fails to teach the present invention in view of the water/saturated lower aliphatic monocarboxylic acid/siliceous support requirements. Deller and Inoue do not cure this shortcoming in the prior art.

Second, Applicants revised claims 28 and 29 require that the ether be a recycled ether which is a reaction by-product. The amendments to claims 28 and 29 help to clarify this point. In contrast, the ethers included within the list bridging columns 7 and 8 of Inoue are not reaction products of the disclosed reaction and are all cyclic ethers. Accordingly, Inoue cannot be deemed to teach the recycling of the reaction product ethers. In fact, what Inoue teaches is the inclusion of these compounds as solvents or diluents. Since the definition of a solvent is a substance capable of dissolving another substance to form a uniformly dispersed mixture at the molecular level, the implication of this teaching is to use a sufficient quantity of the ethers to achieve the complete dispersion of the other reaction products. In contrast, Applicants' step is intended to influence the reaction by suppressing the relatively undesirable formation of ethers. Furthermore, Inoue at column 7, lines 35-39 states that the solvents be inert to the catalyst in the reaction reagents (starting materials and products). Since Applicants claimed ethers are the reaction products, it is difficult to envision the Inoue "inert" requirement suggesting Applicants' step. In this

regard, there is a conflict between Applicants' claimed invention and the Inoue teaching.

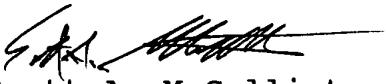
With respect to Deller, there is no mention of making of esters such as ethyl acetate. Moreover, the only reference is to making of alcohol by olefin hydration and the making of vinyl acetate by an acetoxylation reaction in the presence of oxygen. This does not suggest the use of the present silicotungstic heteropolyacid supported catalyst in an esterification reaction. Moreover, catalysis is a highly unpredictable art, and there is no expectation that a siliceous supported catalyst in the Deller process would be suitable in a divergent reaction. Accordingly, withdrawal of the rejection is respectfully requested.

If any fee is due in conjunction with the filing of this response, Applicants authorize deduction of that fee from deposit account no. 06-0308.

In view of the above, Applicants submit that this application is in condition for allowance in such action as respectfully requested.

Respectfully submitted,

FAY, SHARPE, BEALL, FAGAN,
MINNICH & MCKEE


Scott A. McCollister
Reg. No. 33,961
1100 Superior Avenue, Ste. 700
Cleveland, Ohio 44114-2518
(216) 861-5582

CERTIFICATE OF MAILING

I hereby certify that this AMENDMENT is being deposited with the United States Postal Service as EXPRESS MAIL in an envelope numbered EM098341704US addressed to: Assistant Commissioner of Patents, Washington, D.C. 20231, on April 14, 1998.

By: 
Georgette B. George